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ABSTRACT

Third World Science (TWS) materials were developed to add a multicultural element to the existing science curriculum of 11-16-year-old students. TWS attempts to develop an appreciation of the: (1) boundless fascination of the natural world; (2) knowledge, skills, and expertise possessed by ordinary men and women everywhere; (3) application of knowledge, skills, and expertise to the solution of practical problems; (4) impact of modern technology; (5) importance of language in the interpretation and communication of knowledge and ideas; and (6) the influence of the cultural background in the perception of knowledge, problems, and solutions. Provided are discussions of the project's background, development, content and teaching methods, aims and objectives, future development, and availability. Units/topics produced as of July 1982 (or in advanced preparation) include: carrying loads on heads; cement; charcoal; clay pots; dental care; diet and nutrition; food preservation; fuels; housing; iron smelting; methane digestors; natural dyes; natural fibers; plants and medicines; salt; soap; and vegetable oils. The use of the salt unit in a London (England) school with a significant proportion of immigrant students is briefly described. (JN)

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Third World Science
Development Education Through Science Teaching

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Third World Science - Development Education Through Science Teaching

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Background

This paper, and the project it describes, have their origins in the series of international conferences on Integrated Sciences held in the 1970's. Though these conferences did little to resolve the conflict between integrated science and the teaching of the specialist science subjects, or indeed to generate an acceptable definition of integrated science education, one common thread seemed to emerge. This was that the social implications of science ought to feature prominently in the teaching of integrated science.

I remember well Baez's dictum at the UNESCO workshop which led to the publication of New Trends in Integrated Science Teaching Vol. II (1973), that the goals of science education should be Curiosity, Compassion and Competence: Curiosity concerning the world in which we live, Compassion for those in need, and Competence to do something about it. At the conference on Integrated Science Education Worldwide, held in Nijmegen, Holland in 1978, the Dutch scientist-politician J.C. Terlouw delivered an outstanding plenary lecture on Science and Society and as a member of the working group on this topic I was involved in discussions of ways and means of incorporating social issues into science teaching. As on so many other occasions I returned home determined to do something about it, but on this occasion in contrast to many others a number of things contrived to fall into place which have led four years later to the Third World Science materials which are displayed here for the first time.

I have had the good fortune to spend periods of time in various parts of the world and wherever I have gone there have been fascinating examples of science all around us. In Trinidad I played for hours with the sensitive plant mimosa pudica which reacts to touch, and watched a turtle lay its eggs on a lonely beach. In Sarawak a schoolboy calibrated a weighing device for me and another assembled a beautiful, functional brass oil lamp which has served me well through a number of power failures. In Ghana I discussed with boys and girls the use of ashes from burnt banana skins to make soap, discovering the meaning of potash for the first time. And yesterday morning

in Nottingham, on a derelict house opposite my room in Sandby Hall I observed two pigeons engage in a ritual dance that I have only previously seen on film.

I had always considered such experiences to be a bonus in the teaching of science and in the training of science teachers, but found difficulty in seeing how such personal experiences could be transmitted at second or third hand. At the time however, Professor Charles Elliott and his colleagues at University College Swansea were causing me to think about Development Education, what it is, and what science teaching might contribute to it. I now began to see how some of my experiences and others that I had read or heard about could be used to add a social dimension to science teaching. Another similar influence was the original paper published by our chairman Mr Joseph Yakubu, in the Science Teacher (Vol 20 Nos 1 & 2 1976) on "Influences of Culture on Learning and Teaching Science in Northern Ghana".

Development

One piece of good fortune at that time was the return of an enthusiastic student, Trevor Roach, from two years of volunteer teaching, coincidentally in Mr Yakubu's town of Tamale in Ghana, with time on his hands, and the arrival of another, Philip Bladon, from Lubushi Seminary in northern Zambia with a marvellous collection of pupil projects relating to science in the school's environment. A small grant from the Overseas Development Fund, before it fell to the economic axe of a new Government, enabled Trevor to work full time for a term and part time thereafter on the Third World Science project. Its intentions were defined as follows: "To gather and disseminate materials relating to developing countries which will fit naturally into science syllabuses in the UK. In addition to illustrating basic scientific principles, these materials will reflect the social, economic and scientific needs and potential of developing countries".

Trevor Roach set about gathering information, contacting volunteer, contract and local teachers overseas and teachers in Britain returned from overseas, and contacting agencies at home and abroad such as the Intermediate Technology Development Group, the Centre for World Development Education, and the Technology Consultancy Centre of the University of Kumasi, Ghana. Teachers wishing to use the materials were also contacted through the ASE's 'Education in Science' and other journals.

A basic principle established from the beginning was that the material collected had to relate to topics in existing school syllabuses and had to

be usable by teachers in a variety of ways. The material was therefore organised in Units under such titles as Soap, Salt, Carrying Loads, Dental Care. Information sheets were prepared, experiments tested, visual aids sought.. The Lubushi projects were collated and distributed but it proved impossible at the time with the resources available to package any further Units in a form suitable for circulation.

Following a short pause when I moved to my present position at Bangor I was able to attract support from the Manpower Services Commission to take on two unemployed science teachers, one artist and a typist to put the material together in a low cost form suitable for use in schools. The group had no first hand overseas experience but this has not proved to be entirely disadvantageous since the majority of teachers using TWS will be in a similar position.

The Unit produced to date (July 1982) and those in an advanced stage of preparation are as follows:
CARRYING LOADS ON HEADS; CEMENT (in prep); CHARCOAL; CLAY POTS; DENTAL CARE; DIET & NUTRITION (in prep); DISTILLATION; ENERGY CONVERTORS (~~in prep~~); FERMENTATION; FOOD PRESERVATION (in prep); FUELS (in prep); HOUSING; IRON SMELTING; METHANE DIGESTORS; NATURAL DYES; NATURAL FIBRES(in prep); PLANTS AND MEDICINES; SALT; SOAP; VEGETABLE OILS (in prep).

With material of this sort no Unit can ever be exhaustive, and many other Units could be produced.

Content and Teaching Methods

The target audience is the 12 - 15 year old secondary school pupil, though teachers will undoubtedly find ways of using some of the material with both older and younger pupils. It would be as well to emphasis here that the materials are designed for use in the UK, as enrichment material for use with regular science syllabuses. It is not suggested that the approach is appropriate for schools in the Third World though science educators and teachers may wish to consider whether the principles involved are relevant.

Most Units contain information sheets, illustrations, copies of relevant documents, suggested activities and brief notes for teachers. The latter are deliberately not prescriptive, not even of the age or ability for which a Unit is considered to be suitable, and teachers are invited to use the materials as they wish.

Starting with the banana skin soap making project it quickly became apparent that the focus of the project would not be purely on scientific curiosities, but rather on the knowledge, skills and expertise of ordinary, and extraordinary, people in the third world, and their application to the everyday problems of real life. The Salt unit took us in the same direction, and it became apparent that one fruitful teaching strategy is to pose the question "What would you do in these circumstances?" Technology thus has a central position in the teaching.

Another teaching strategy that has proved to be a fruitful one is the use of written material from pupils of about the same age as our own in the Third World. In this repect the Lubushi projects have proved invaluable as have materials relating to salt written by pupils in the Turks and Caicos islands and in Papua New Guinea. Careful reading of this material, left largely unedited, forces pupils to think carefully "What is this boy or girl trying to say to us?" In so doing they learn about science and about communication. This aspect of the project is one that I hope to develop further.

Aims and Objectives

In curriculum development generally aims and objectives are modified in the development of the project. At this stage in the project it appears to me to be worth attempting a formulation of the aims of TWS, at least as far as the development education aspects of the project are concerned. I want to be realistic, for I know that enrichment material of this sort will be used occasionally, as teachers see fit, and I do not believe that a few lessons here and there are likely to have major cognitive or affective outcomes. To affect fundamental attitudes such as racial prejudice and concern and compassion requires at least a co-ordinated programme in the social sciences and humanities, to which science would have an important contribution to make, and I do not therefore wish to make extravagant claims which are impossible of fulfilment.

My hope is that the use of TWS materials will make some impression in a limited number of areas, set out below and briefly elaborated. I offer them speculatively, for discussion and testing, rather than as established outcomes.

Third World Science attemps to develop an appreciation of:

1 The boundless fascination of the natural world.

The curiosity of science recognises no boundaries. By selecting novel examples from unusual settings it is hoped that the interest generated will ensure that basic principles are better understood.

2 The knowledge, skills and expertise possessed by ordinary men and women everywhere.

Much of the common knowledge that is required for survival in different climates and conditions is scientific in nature. When survival is assured the same applies to activities designed to improve the quality of life. Even if the possessors cannot fully articulate their knowledge its presence is clearly demonstrated by their actions. This may also lead us to value the common knowledge of our own community - gardeners and fishermen, cooks and carpenters, motoring enthusiasts and hi-fi buffs.

3 The application of knowledge, skills and expertise to the solution of practical problems (i.e. technology).

The practical problems of the Third World are so intimately connected with basic human needs (rather than the contrived commercial needs of developed societies) that the fundamental importance of technology as a human endeavour immediately becomes apparent. In traditional practices the ingenuity and the inventiveness of the technological process may long since have passed out of people's awareness, but its origins may still prove to be a fruitful source of discussion. The question "What would you do in these circumstances?" puts the student in the creative role of technologist, innovator, survivor.

4 The impact of modern technology.

We know in our own society that we have lost much of the knowledge and many of the skills that our grandparents possessed, replacing them with others which generally make us more dependent upon services and utilities. The storage and preservation of food may be cited as an example. Traditional technologies in the Third World can become obsolete, and the use of appropriate technology may do a great deal to improve the quality of life, but reliance upon modern technology may also impair the abilities of men and women to survive on their own resources.

5 The importance of language in the interpretation and communication of knowledge and ideas.

What people write and say has to be interpreted in the light of the language that they have at the disposal. This is particularly true where the language of communication is a second or a third language, and where the native language has a greater or a more limited repertoire in specific cases, for example the multiplicity of Eskimo words for snow and ice and the lack of colour terminology in Australian Aborigine language. Clear and unambiguous description is one of the aims of science, but careful consideration of accounts, preferably by pupils' peers in the Third World shows how difficult this is to achieve, and if it is difficult in science we may appreciate how much more difficult it may be in areas such as ethics or politics.

6 The influence of the cultural background in the perception of knowledge, problems and solutions.

Tradition, myth and legend form an important part of everyone's interpretation of his environment. Custom and usage may determine what is regarded as a problem, and social values may constrain what is acceptable as a valid solution. Other people's myths and values may be easy to identify but this should cause us to examine our own in the same light.

Taking these six areas I suggest that "an appreciation of" them involves the following:

	Areas					
	1	2	3	4	5	6
Knowledge and comprehension of	✓	✓	✓	✓	✓	✓
An interest in and a desire to know more about	✓	✓	✓	✓	✓	✓
Respect for individuals and societies and their achievements		✓	✓		✓	✓
Recognition of needs and problems other than our own			✓	✓		
Readiness to seek solutions to problems			✓	✓		
Willingness to seek parallels in our own community		✓			✓	✓

Future Development

Even before the release of the present Units interest has been expressed from several quarters. Groups of science teachers interested in multi-ethnic or development education in London, Glasgow, Leeds and Bristol have requested copies. VSO has expressed an interest in using TWS to train volunteer teachers before they go abroad so that when they return they may contribute more effectively to development education. Sets of Units have been requested by Departments of Education in Universities and Colleges of Education, and by many individual teachers for different purposes.

It is hoped that all these groups will develop their own strategies for the use of TWS materials and that we will be able to collect the feed-back and make it generally available. I recognise that, at the moment, the material is little more than a resource and that we need much more experience before we can say that we have a means and a strategy for achieving our aims.

Availability

From the Autumn (1982) copies of Third World Science materials may be purchased form the Centre for World Development Education, Buckingham Palace Road, London. SW1W 9SH, at £2 per Unit, 20% discount for full sets (postage additional). Further details of the project from the author.

Case Study SALT

Trevor Roach, now teaching in Feltham School, Hounslow, London, a school with a significant proportion of immigrant pupils, describes the use of the Salt unit.

"After the end-of-year examinations it was clear that only a handful of second year pupils understood the concepts of filtration, recrystallisation and evaporation. I managed to fit in some lessons with a top band and a middle band form on Salt after the exams".

Lesson One Separating salt and sand - standard approach.

Lesson Two and homework Importance of Salt in Diet (information as in Unit). Salt from mines and from the sea, following map and worksheet in the unit (More information concerning solar salt production has subsequently become available for this topic).

Lesson Three "How could you obtain salt if you lived in a remote village in the north of Ghana?" Practical work - different plants burnt and salt extracted from their ashes, following instructions in the Unit.

Pupil comment "This is the best practical work we've ever done sir!"

Wall display of accounts and illustrations from Zambia and Tanzania of salt being obtained from muddy ground. Questions to be answered and an account of the practical work to be written.

Lesson Four Reading accounts of traditional salt making processes written by pupils in Papua New Guinea and identifying processes used in Africa but apparently not developed in PNG. I was rather afraid that the kids would be scornful of the simple English used by the PNG pupils but I explained to them that these were children learning English in a secondary school and writing specially for them, and the reponse was very good.

Homework "Your family are the only people to survive a nuclear war, and the atmosphere is no longer polluted by radioactivity when you emerge from your shelter. Describe three ways of obtaining salt for your family's diet using material around you". A bit gloomy I know but the kids seemed to find it realistic and they came up with some lovely ideas. What pleased me most was they they were using terms such as filtration, crystallisation and evaporation with confidence.

The head of chemistry and his deputy were very pleased (Trevor is a biology teacher). I think the work went well and that I would rewrite the Unit to make it even better.